of tube-building protozoa of the genus Stichotricha, one of which had taken up its abode in the tube of a stentor still inhabited by its rightful owner, but the result did not seem to be very satisfactory to the intruder. Rotifers noted included *Brachionus bakeri*, Ehr., Stephanops (probably *lamellaris*, Ehr.), *Limnias ceratophylli*, Schrank, *Melicerta ringens*, Ehr., and many beautiful clusters of *Megalotrocha alboflavicans*, Ehr. These last are spoken of by Hudson and Gosse as being rare, but our experience seems to indicate that they are quite plentiful in many of the ponds near Melbourne. Of Entomostraca, three orders were represented, but the number seen was not large. Desmids and other algæ were conspicuous by their absence.—J. Stickland.

SOME COASTAL PLANTS: THEIR SHELTER VALUE AND FIRE DANGER.

By T. S. Hart, M.A., B.Sc.

(*Read before the Field Naturalists' Club of Victoria, 9th Feb.*, 1914.)

The prevalent coastal tea-tree scrub is well known to be highly inflammable; but any extensive removal of vegetation on an open, sandy coast, either to make clear fire-breaks or by general thinning, would be likely to lead to serious and increasing sand-drifting. The practical problem becomes that of preserving a sufficient covering of vegetation of the least inflammable kinds possible.

I desire to indicate how improvement may be made while still utilizing the native plants of the coastal scrubs. Besides observations made previously on the manner of growth of some of the plants, I have recently made some rough tests of the ease of ignition of the foliage of several species, including a few introduced plants which are quite at home in the same situations. The tests were made by heating on a rack over a gas-ring, with uniform flame during each series of tests. The results may be summarized as follows:—

1. Most inflammable, quick ignition, and plenty of flame—
   Leptospermum lævigatum, Coast Tea-tree, and
   Leucopogon Richei, Native Currant.
2. Easily ignited—
   Bursaria spinosa, Sweet Bursaria.
   Correa alba, White Correa.
   Casuarina quadrivalvis, Drooping Sheoke.

Under moderate heat the sheoke glowed and burned away rapidly without flame. This manner of burning and the character of the plant would make it less dangerous as a contributor to a fire.

3. Fire-resisting plants—

Acacia longifolia, var. *sophoræ*, Coast Wattle.
Rhagodia Billardieri, Sea Berry.
Tetragonia implexicoma, Warrigal Cabbage.
Muehlenbeckia adpressa, Climbing Lignum.
Myoporum insulare, Boobialla.

—especially the last three, but the others were not far behind.

Of introduced plants tested, *Coprosma lucidum*, Looking-glass Plant, must be put with the strongly resistant plants.

In *Cytisus proliferus*, Tagasaste or Tree-lucerne, the leaves caught more easily than Bursaria, though young stems were not ignited so readily. Foliage of *Tecoma capense*, Tamarix, and Plumbago caught quite easily.

In addition, I looked for any effect of the various plants on the recent fire at Chelsea. The fire was largely in young tea-tree; the proportion of other species in the scrub at this place is low. An ordinary cart-track, 8 feet or so in width, was often sufficient to secure that tea-tree on its farther side was only scorched, though at a very short distance beyond the fire regained its full destructiveness. A much wider space without tea-tree would be necessary for a safe fire-break. At one place where there was much coast wattle at one side the width of the fire was much lessened, but other causes may have assisted.

The shelter required for such a coastal residential area needs to check the movements of the sand; to protect house and garden from wind and sand and from view to an extent varying with the individual taste; to protect from the sun, and to be pleasing to the eye.

We may regard the vegetation from this point of view as of four parts—(1) the main shelter of shrubs and small trees from the height of a hedge to trees under the shade of which one can comfortably sit: (2) the bushes and smaller plants which thicken the lower parts of the scrub, and are especially important on the seaward side; (3) the smaller ground plants; (4) scattered trees mixed with the scrub, and often standing up above it. These diversify the aspect of the scrub, but in usual quantities do not much alter its shelter value or the danger of fire.

The main shelter about Chelsea approaches a pure tea-tree scrub. *Acacia longifolia*, var. *sophoræ*, is not in large proportion. The Coast Honeysuckle belongs with the trees which rise above the scrub. The Boobialla, if present, is not here common. Elsewhere Coast Wattle and Boobialla are more abundant. Near Devonport, Tasmania, there is a coastal scrub in which Coast Wattle and Boobialla are the chief constituents, without Leptospermum. This is associated with a

coarse shingle, with much less fine sand. At one place near Ulverstone, Tasmania, as seen from the railway, Coast Wattle is strongly predominant, with a little Boobialla: no Leptospermum was noticed at this place.

The danger from fire can be greatly reduced by planting or encouraging the natural growth of fire-resisting vegetation partly mixed with the tea-tree, but in part to the complete exclusion of tea-tree over strips sufficient to act as fire-breaks. At the same time a diversified scrub, much more pleasing to the eye than pure tea-tree, would be formed.

Of native plants the Boobialla takes first place. It is strongly resistant to fire; it is easily propagated—even large cuttings strike readily in sandy soil; it is of rapid growth. Trimmed to one main stem, it gives a fine shade overhead. A row of four trees, a few years old, at Brighton Beach station, shade a strip about one chain long, and are about 13 feet high. If cut and made to branch low it will make a good hedge. It will flourish in full exposure and carry foliage well down to the ground, making a good protection against wind. Its colour, bright green, will considerably enliven the dull aspect of the tea-tree. More than one variety of Myoporum is called Boobialla. Other forms would be useful as far as they share these characters.

Coast Wattle will also grow tall enough to give some overhead shelter. In full exposure it makes extensive low patches, or it may grow taller and keep its foliage well down to the ground on the exposed side. It roots from buried branches — a character which increases its value for holding sand. Sometimes it is attacked by a gall-producer. Good plants of either this wattle or of Boobialla are better shelter against wind than old tea-tree, which goes bare underneath.

If tea-tree is used for wind-breaks it should be interrupted at intervals by considerable patches of non-inflammable plants. Tea-tree hedges should not lead up to the vicinity of buildings, and a tea-tree hedge or wind-break alongside a cart track is a waste of a good opportunity to secure some protection from fire by non-inflammable vegetation.

Of the introduced plants, *Coprosma lucidum* can also be used for hedges. Box-thorn must be regarded as inadmissible. Tree-lucerne is less resistant to fire.

Of the smaller plants, Muehlenbeckia appears quickly after a fire. It was most advanced of all on the burnt area at Chelsea five weeks after the fire. Plants of tea-tree and of honeysuckle which had only been scorched were also shooting again, and partly burnt plants of *Correa alba*.

Correa alba is decidedly at its best in full exposure; where sheltered it is more straggly. It has the power of rooting from

buried branches, which adds to its value on the outside edge of the shelter.

Leucopogon Richei, in quantity, would be an element of danger, being easily ignited.

Tetragonia implexicoma and *Rhagodia Billardieri* are both very useful in thickening the protection on the seaward side. Tetragonia covers the ground often just behind the first shelter, but can get started with only the shelter of the grasses outside the shrubs, though it seems to like to start with some protection. Accumulation of dead material under Tetragonia and Rhagodia may possibly lessen their utility against fire.

Mr. J. H. Maiden, F.L.S., in "The Forest Flora of New South Wales" mentions the Coast Honeysuckle as an excellent tree for sandy coast-lands, while it is also ornamental. If the "cones" are heated at 120° Fahr. the seeds drop out, and can be sown a quarter of an inch deep in leaf soil and sand mixed. As regards ease of ignition, I find it probably not quite so resistant as Coast Wattle, though my tests are not decisive. It occurs among the shrubs of the outer edge, and well-grown trees are sometimes found on the seaward side, as well as amongst the scrub generally. The same work also mentions sheoke as an excellent seaside plant. Its beauty is unaffected by wind; it is propagated from seed. "Physicus," in the *Australasian* (19th August, 1911), called attention to Myoporum (Boobialla) as a neglected hedge-plant, though the example quoted may not have been our common coastal species.

Bursaria has a strong claim to inclusion as scattered trees, on account of its fine show of white and scented flowers at midsummer, and it is not lacking in beauty in fruits and young foliage at other seasons; but it is inflammable, and should be reckoned with the tea-tree in taking precautions against fire.

As to arrangement of planting or preserved shelter, that on the seaward side should evidently be as complete as possible. Necessary access to the beach, either for private or public use, should be by paths with an angle, at least to the extent of a good patch of scrub directly opposite the outer end of a straight short path. Long, straight paths of any sort should be avoided, except perhaps parallel to the coast, and well away from it. A path which comes out obliquely to the beach, but is otherwise straight, is exposed to wind directly from that quarter. Care should be taken of the scrub alongside paths, so that they are not unduly widened. The seaward end of a road that is cleared should have artificial protection with a view to immediate restoration of a block of scrub.

A considerable mixture of non-inflammable plants should be preserved, or introduced where they do not at present occur

in large quantity. Some parts of the scrub should be entirely of fire-resisting plants. Even narrow tracks could be made useful as fire-breaks by belts of suitable vegetation alongside them, and a practice might well be made of separating adjacent allotments by non-inflammable hedges. There is no need to stint the hedge, either in width or height, if it will not burn. The protection of a good hedge facilitates a little garden, which in its turn may add to the security from fire. Careful preservation and planting of suitable native plants could then produce a coastal scrub more diversified, more pleasing in aspect, and safer, and at the same time equally effective for shelter and protection, and as typically coastal and Australian as the present scrub, with its strongly predominant tea-tree.

THE INCUBATION OF THE MUTTON-BIRD EGG.

By JOSEPH GABRIEL.

(*Read before the Field Naturalists' Club of Victoria, 9th March*, 1914.)

DURING the Club excursion to the Furneaux Group of islands, in Bass Strait, in November, 1893 (*Vict. Nat.*, vol. x., p. 167, Feb., 1894), those interesting people, the so-called half-castes, supplied us with some very interesting notes regarding the habits of the Short-tailed Petrels or Mutton-birds, *Puffinus brevicaudus*, Gld., and one of them stated at the time that the incubation of the egg took eight weeks. As he made this statement so confidently I accepted it as correct until a few years ago, when I determined to test the subject myself.

In December, 1911, Mr. Dixon, who resides in the immediate vicinity of "Murray's Rookery," on Phillip Island, kindly consented to watch the birds for me. The rookery having been depleted of its eggs up to 30th November (last day of egging), and as I was there on 3rd December, when there was a bird in nearly every hole, I thought this was a fair chance to get a good result; but my friend's memory failed him, and when he visited the holes he had to calculate the chicks were about a week old, and that the hatching took about a month. As this was not satisfactory, in December, 1912, a friend of mine at Rhyll obligingly placed three eggs in an incubator, with the result that one chick came out in forty-six days; the other two eggs were damaged a few days before, but had dead chicks.

As I was still hungering for better results, on 30th November of last year my incubator friend, Mr. M'Veen, at my request, kindly placed eight eggs under a domestic hen. In due time I received the following note from him:—"Only one out of the Mutton-bird eggs came out; the bird was hatched on forenoon of 15th January. It was a strong, fully-